REMARKS

With entry of the foregoing Amendment, claims 1 and 3-24 are now pending in the application. In the last Office Action, the Examiner rejected claims 1-3. No claim has yet been allowed. Claims 1 and 3 have been amended. Claim 2 is now canceled with its features being incorporated into amended claim 1.

New claims 4-24 have been added. No new matter is introduced, and support for these recently added claims is found in the specification as originally filed. Reconsideration is respectfully requested.

Introduction

The present invention is directed to a method of providing multiple grades of wireless service for data communication between a base station and multiple subscriber units over one or more CDMA communication channels. Each grade of service has a corresponding priority level. In particular, bandwidth resources are shared in a way that degradation of service experienced by a particular user happens fairly and in a graceful fashion, so that users demanding excessive bandwidth over time are allocated fewer resources than users that have historically used fewer resources.

According to one aspect of the invention, a threshold amount of bandwidth resources is defined and used to identify a priority level for a user requesting an allocation of bandwidth. The priority level of the user depends on whether a previous historical usage of resources by that user exceeds the threshold. Preferably, the threshold is a cumulative amount of data information that a user can transmit over a specified period of time without being assigned to a lower priority level. The identified priority level entitles the user to a particular grade of service and thus, a corresponding amount of bandwidth that can be allocated to the user for data transmission.

Specifically, if the previous historical usage by the user is higher than the threshold, the user is assigned a lower priority level for transmitting data information. The lower priority level entitles the user to fewer channels than otherwise allowed when a higher priority level is assigned. In other words, the user is penalized for overuse. Conversely, if the previous usage by the user is lower than the threshold, the user is assigned a higher priority level for transmitting

data information. The higher priority level entitles the user to more channels than otherwise allowed when a lower priority level is assigned. A user is no longer penalized for overuse if he discontinues use of the wireless communication system for a period of time such that actual usage falls below the threshold.

According to a second aspect of the invention, the identified priority level of the user defines a maximum continuous allocation of resources entitled to the user to transmit data information. While the user continuously transmits data from its subscriber unit to the base station, the present invention detects whether a time limit for continuous data transmission has been exceeded based on the corresponding priority level of the user. If so, the data transfer is discontinued, the previously assigned channels are deallocated, and the user is assigned a lower priority level, which entitles to fewer channels than otherwise allowed when a higher priority level is assigned.

Claim Rejections - 35 U.S.C. § 103

The Examiner rejected claims 1 and 2 under 35 U.S.C. § 103(a) as being unpatentable over Hou in view of U.S. Patent 6,101,176 to Honkasalo, et al. ("Honkasalo"). Claim 2 has been cancelled with its features being incorporated into claim 1 as now amended.

In Hou, bandwidth is allocated according to a user hierarchy in which premium users are assigned more bandwidth than non-premium users. Hou discloses that a historical record of bandwidth usage may be maintained for each user. Then, "users who have relatively low usage levels may be given higher priority when requesting a bandwidth level that might otherwise be limited." (Hou, col. 11, lns. 50-68).

However, Hou does not teach or suggest that users who have relatively high usage levels may be given lower priority when requesting a bandwidth level that might otherwise be greater. Rather, Hou suggests that a ceiling value may be defined to limit the maximum bandwidth allocated to each user. In other words, once the user has been assigned its maximum bandwidth as specified by the ceiling value, no further bandwidth is available for that user. This abrupt termination of bandwidth resources does not enable sharing of bandwidth resources in a way that happens in a fair and graceful fashion. (Hou, col. 11, lns. 30-36)

In contrast, the present invention, as now recited in claim 1, identifies a priority level of a user requesting allocation of bandwidth depending on whether a previous historical usage of resources by the user exceeds a threshold. Specifically, if the previous usage by the user is higher than the threshold, the user is assigned a lower priority level for transmitting data information. The lower priority level entitles the user to fewer channels than otherwise allowed, when a higher priority level is assigned. Thus, historically "heavy" users are serviced at a lower rate for that time period when actual historical usage exceeds the threshold. This is in contrast to Hou, who has a simpler approach of abruptly terminating all access to bandwidth resources once a single ceiling value is reached.

For example, Fig. 2 of the present application is a graph illustrating resource usage by a particular user over a course of a month. Line B represents a threshold of allowed usage for the given user at any given time over the one month period. When a user's actual aggregate usage (line C) exceeds the threshold of allowed usage (line B) at a given time in a month, the priority level of that user is then reduced due to overuse. Accordingly, that user is serviced at a lower rate for the time period when line C exceeds line B. (Fig. 2; specification, page 8, lns. 5-26).

Conversely, if the previous historical usage by the user is lower than the threshold, the user is assigned a higher priority level for transmitting data information. The higher priority level entitles the user to more channels than otherwise allowed when a lower priority level is assigned. For example, in Fig. 2 of the present application, if actual resource usage (line C) is less than a corresponding point on the graph for the threshold of allowed usage (line B) then the priority level of the user is generally based only on the user's predetermined subscription grade, or "priority level 1." Furthermore, a user is no longer penalized for overuse if she discontinues use of wireless communication system 100 for a period of time such that actual usage on line C is again less than the threshold of allowed usage (line B) at a given point in time. For example, by day 20, the actual usage at a point on line C is again less than allowed usage on line B. (Fig. 2; specification, page 8, lns. 5-26).

Thus, the present invention shares bandwidth resources (e.g., channels) in a way that degradation of service experienced by a particular user happens fairly, so that the users demanding excessive bandwidth over time are allocated fewer resources than the users that have historically used fewer resources.

More particularly, claim 1 has been amended to more clearly recite these features. Support for this amendment can be found at least in Fig. 2 and in the specification on page 8, line 5-26.

Hou does not teach or suggest identifying a priority level of a user requesting allocation of bandwidth for transmitting data information to a base station depending on whether a previous historical usage of resources by the user exceeds a threshold, such that "if the previous usage by the user is higher than the threshold, the user is assigned a lower priority level for transmitting data information, the lower priority level entitling the user to use of fewer channels than otherwise allowed when a higher priority level is assigned."

At best, Hou discloses a ceiling value that may be defined to limit the maximum bandwidth allocated to each user. Once this ceiling is reached, no further bandwidth resources may be allocated to that user. Unlike the present invention, such an abrupt termination of bandwidth allocation does not enable sharing of bandwidth resources in a way that happens in a fair and graceful fashion. (Hou, col. 11, lns. 30-36)

Honkasalo also does not teach or suggest these features. Rather, Honkasalo discloses a method and apparatus for operating an indoor CDMA telecommunications system. Specifically, Honkasalo discloses a method and apparatus for reducing interference between two radio communication networks that have overlapping areas of coverage and use the same range of radio frequencies. (Honkasalo, col. 1, lns. 10-16)

For at least these reasons, it is believed that amended claim 1 is novel and not obvious, and thus patentable, in view of the prior art of record.

Claim Rejections - 35 U.S.C. § 102

The Examiner also rejected claim 3 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent 6,324,184 to Hou, et al. ("Hou").

Claim 3 as originally filed recites "[a] method of providing multiple grades of wireless services in a demand access communication system, in which grade of service depends on historical use of available resources and continuity of resource allocation."

Claim 3 has been amended to depend from independent claim 1. Therefore, the arguments with respect to claim 1 apply equally to amended claim 3. Specifically, with respect

to the grade of service "depending on historical use of available resources," Hou does not teach or suggest identifying a priority level of a user requesting allocation of bandwidth for transmitting data information to a base station depending on whether a previous historical usage of resources by the user exceeds a threshold, such that if the previous usage by the user is higher than the threshold, the user is assigned a lower priority level for transmitting data information, the lower priority level entitling the user to use of fewer channels than otherwise allowed when a higher priority level is assigned. At best, Hou discloses a ceiling value that may be defined to limit the maximum bandwidth allocated to each user. Once this ceiling is reached, no further bandwidth resources may be allocated to that user. Unlike the present invention, such an abrupt termination of bandwidth allocation does not enable sharing of bandwidth resources in a way that happens in a fair and graceful fashion.

With respect to the grade of service "depending on continuity of resource allocation," the Examiner is of the opinion that Hou also discloses this feature. As previously discussed, Hou admittedly discloses a method of allocating bandwidth to individual subscribers according to a user hierarchy in which premium users are assigned more bandwidth than non-premium users. Additionally, Hou also discloses that when a user continually uses all of its assigned bandwidth, some of the bandwidth (e.g. slot) assignment of the user can be redistributed to other users who use all or most of their assigned bandwidth. Hou suggests that it is possible to use a "timing mechanism to provide a heavy user with additional bandwidth, but only for a certain amount of time." (Hou, col. 11, lns. 37-50) But these do not amount to teaching, as in the Applicants' claims, that historical usage is a factor in determining priority.

Claim 3 has been amended to clarify that while the user continuously transmits data from its subscriber unit to the base station, the present invention detects whether a time limit for continuous data transmission has been exceeded based on the corresponding priority level of the user. If so, the data transfer is discontinued, the previously assigned channels are deallocated, and the user is assigned a lower priority level, which entitles to fewer channels than otherwise allowed when a higher priority level is assigned. Support for this amendment can be found at least in Figs. 3, 4A-4B and in the specification on page 11, line 14 through page 13, line 3.

Hou does not teach these features. Rather, Hou merely suggests that some of the additional bandwidth may be redistributed to other users after a time limit is exceeded. Hou does

not teach or suggest penalizing such heavy users for excessive continuous allocation of bandwidth resources by dropping their priority levels so that the users must then compete for fewer bandwidth resources at the lower priority level.

For at least additional these reasons, it is believed that amended claim 3 is also novel and not obvious, and thus patentable, in view of the prior art of record.

New Claims 4-24

Claims 4-24 have been added for further consideration. No new matter is introduced by these additional claims.

Specifically, claim 4 is similar to claim 1, focusing on the feature of identifying a priority level of a user requesting allocation of bandwidth for transmitting data information to a base station depending on whether a previous historical usage of resources by that user exceeds a threshold, the priority level of the user capable of fluctuating between higher and lower priority levels such that: (i) if the previous usage by the user is higher than the threshold, the user is assigned a lower priority level for transmitting data information, the lower priority level entitling the user to use of fewer channels than otherwise allowed when a higher priority level is assigned, and (ii) if the previous usage by the user is lower than the threshold, the user is assigned a higher priority level for transmitting data information, the higher priority level entitling the user use of more channels than otherwise allowed when a lower priority level is assigned. Support for this amendment can be found at least in Fig. 2 and in the specification on page 8, line 5-26.

Claim 5 recites the feature of priority level defining a maximum continuous allocation of resources entitled to the user to transmit data information from a subscriber unit to a base station over multiple assigned traffic channels of the wireless communication system. Support for this amendment can be found at least in Figs. 3, 4A-4B and in the specification on page 11, line 14 through page 13, line 3.

Claim 6 recites the steps of detecting whether a time limit for allocated channels has been exceeded for a continuous transmission of data based on a corresponding priority level of the user and, if so, the method further comprising (i) discontinuing a data transfer by the user; (ii) deallocating use of previously assigned channels; and (iii) decreasing the priority level of a field unit to a lower priority level, the lower priority level entitling the user to use of fewer channels

than otherwise allowed when a higher priority level is assigned. Support for this amendment can be found at least in Figs. 3, 4A-4B and in the specification on page 11, line 14 through page 13, line 3.

Claim 7 recites the feature of the user being allocated resources depending on a cumulative amount of data information previously transferred from a subscriber unit to a base station. Support for this amendment can be found at least in Fig. 2 and in the specification on page 8, line 5-26.

Claim 8 recites the feature of the threshold defining a cumulative amount of data information that a user can transmit over specified period of time without being assigned to a lower priority level. Support for this amendment can be found at least in Fig. 2 and in the specification on page 8, line 5-26.

Claim 9 recites the feature of the threshold varying over time. Support for this amendment can be found at least in Fig. 2 and in the specification on page 8, line 5-26.

Claim 10 recites the feature of the previous usage of resources being determined by comparing usage over a period of at least several past days. Support for this amendment can be found at least in Fig. 2 and in the specification on page 8, line 5-26.
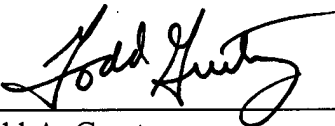
Similarly, claims 11-17 and claims 18-24 respectively recite corresponding apparatus and article of manufacture according to the invention.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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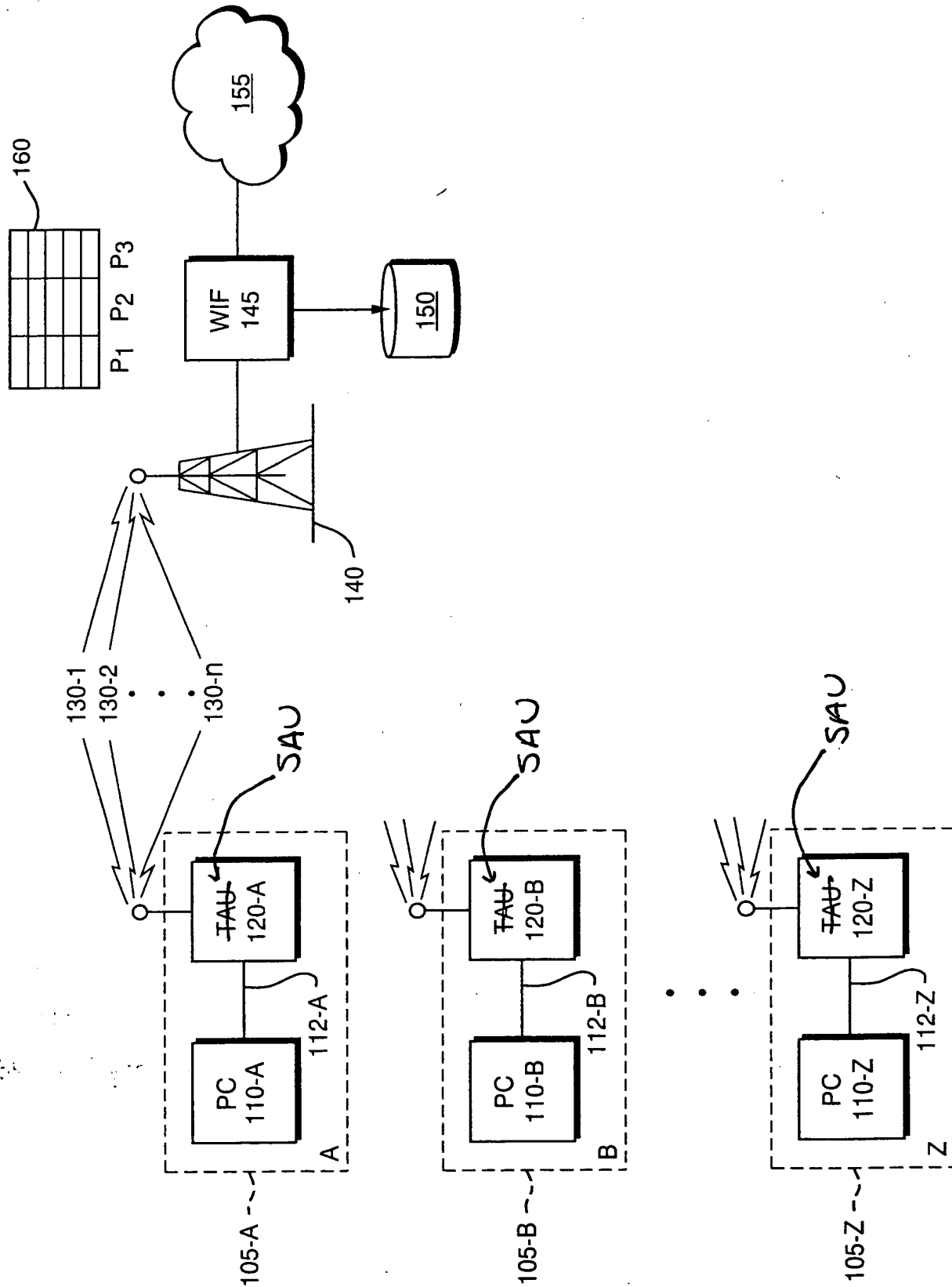
Concord, MA 01742-9133
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Appl'n No.:   09/778,478
Title: Grade of Service and Fairness Policy....
Inventor: Carlo Amalfitano
            Annotated Marked-Up Drawings

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FIG. 1